Heart Rate Variability Amplitude vs. Blood Pressure

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Research Goals

1. Assess the correlation between HRV amplitude ($HR_{\text{max}}$ minus $HR_{\text{min}}$) and conventional blood pressure.

2. Determine how blood pressure changes with resonant breathing with HRV feedback.
Method (1)

1. Open study with no limitations on age, gender, medication, health status, time of day...

2. Participants include EEG Biofeedback, Stress management clients, parents and family member of clients as well as volunteers.

3. The Study consists of 42 clients and 103 assessments.

4. Time frame 2007-2009
Method (2)

1. Participants have at least 10 minutes of quiet transition time prior to assessing blood pressure.

2. Participants were seated in an upright position. Blood Pressure was assessed with the arm at heart level. (Left or right arm.)

3. Blood pressure was assessed by auscultation with a standard Sphygmomanometer and stethoscope. Stethoscope placement was over the brachial artery (medial part of the cubital fossa).

4. Participants are seated in front of a monitor with a HRV Biofeedback program with a graph screen. Using a resonant breathing technique of 5 breaths per minute (equal inhalation and exhalation) for 8-12 minutes with the goal of elevating HRV amplitude.

5. Blood pressure was assessed immediately after completing the 8-12 minutes of HRV Biofeedback.
Method (3)

1. HRV amplitude is determined by subtracting the average peak ($HR_{\text{max}}$) from average valley ($HR_{\text{min}}$) heart rate.

2. Data is randomized and graphed:
   - Average blood pressure pre-session
     $\text{Average Blood Pressure} = \frac{(\text{Systolic} + \text{Diastolic})}{2}$
   - Average blood pressure post-session
   - Delta blood pressure pre vs. post
   - HRV amplitude

3. 4 quadrant analysis
Average Blood Pressure Pre-Session

Average Blood Pressure = \frac{[(Systolic + Diastolic)/2]}{2}

23/103 (22%)

79/103 (76%)

Normotensive Blood Pressure

<1%
**Average Blood Pressure Post-Session**

Average Blood Pressure = \[\frac{(\text{Systolic} + \text{Diastolic})}{2}\]

- **Above 100 mmHg**
  - 8/103 (8%)

- **Below 100 mmHg**
  - 89/103 (86%)

**Normotensive Blood Pressure**

- 100 mmHg \[\frac{(120+80)}{2}\]
- 6 on the line (6%)
Average Blood Pressure & HRV Amplitude

Note: Average Blood Pressure = [(systolic+diastolic)/2]; HRV Amplitude = Peak-Valley
Average Blood Pressure vs. HRV Amplitude Post Session

Note: Average Blood Pressure = [(systolic+diastolic)/2]; HRV Amplitude = Peak-Valley
Average Blood Pressure Post-Session vs. HRV Amplitude

HRV Amplitude

<table>
<thead>
<tr>
<th>Above</th>
<th>Below</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;13 beats</td>
<td>&gt;13 beats</td>
</tr>
<tr>
<td>6/103 (5%)</td>
<td>1/103 (&lt;1%)</td>
</tr>
<tr>
<td>(2%)</td>
<td>(4%)</td>
</tr>
<tr>
<td>(5%)</td>
<td>(57%)</td>
</tr>
<tr>
<td>26/103 (25%)</td>
<td>59/103</td>
</tr>
<tr>
<td>100 mmHg [(120+80)/ 2]</td>
<td></td>
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</tbody>
</table>

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Blood Pressure Changes Post Session

Average Blood Pressure = \[ \frac{(Systolic + Diastolic)}{2} \]

Goes Up

- 6/103 (6%)
- Average change = +5 mmHg

Goes Down

- 96/103 (93%)
- Average change = 8.7 mmHg
Conclusions re. Goal 1

1. Clients that exhibited average blood pressure above normo-tensive (5%), demonstrated HRV amplitudes less than or equal to 13 beats.

2. One instance where HRV amplitude > 13 beats exhibited average blood pressure greater than normo-tensive.

3. 30% of clients demonstrated HRV amplitude less than or equal to 13 beats but did not exhibit average blood pressure above normo-tensive.
Conclusions re. Goal 2

1. 23/103 demonstrated average blood pressure greater than normo-tensive prior to session; 8/103 after session, a reduction of 63%.

2. 6/103 demonstrated higher average blood pressure post-session vs. pre-session. The average positive change was 5mmHg.

3. 86/103 demonstrated lower average blood pressure post-session vs. pre-session. The average negative change was 8.7mmHg.

4. 1/103 demonstrated the same pressure post and pre session.
Thank You

Please contact either Steve or Dee for more information.

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